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From abnormal to normal—Two tales of growth from 25 years of transition

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Abstract

In this paper we look at the growth experience of 25 transition countries during the 25 years since the dissolution of the USSR. We find that compared to expectations from a parsimonious growth model the region in the 2000's seems normal in terms of growth performance, i.e. transition in the region is over in this respect. Institutions, speed of reform and macro variables fail to show a stable correlation with (conditional) growth when comparing the early and later periods of transition. We also find that the countries in the former Soviet Union (FSU12), doing substantially worse during the 1990's, in the 2000's are performing better than the 10 countries that joined the EU in 2004 and 2007 (EU10). This is partly explained by rising fuel prices but also point to strong macro forces of mean reversion. Despite this, the gap between the regions is wider in 2015 than in 1991, emphasizing the challenge of making up for deep crises. Finally, the model analysis suggests that looking forward the main challenge for the FSU12 countries (in particular the non-fuel exporters) is to promote more capital investment whereas the main challenge for EU10 is to increase the productivity of existing factors of production.

Keywords: Growth, transition countries, comparative performance, economic crisis, mean reversion.

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Introduction

In this paper, we take a careful look at the growth experience of the countries in Central and Eastern Europe (CEE) and the former Soviet Union (FSU) since the transition towards market economies started. The main analysis revolves around out of sample predictions based on a robust and fundamental model of economic growth (Levine & Renelt, 1992, henceforth referred to as LR92) and comparisons between those predictions and actual outcomes. We systematically divide our analysis across different groups of countries and across different time periods. In so doing we aim to contribute to primarily two different debates. The first debate concerns whether transition is over and the extent to which the countries in the region as a group, and to some extent individually, can be regarded as "normal" countries in this narrow growth dimension.[1] The second debate revolves around how to understand the varying experiences of different groups of countries (the early reformers that joined the EU versus the less reformed FSU countries) in the early years of transition versus the more recent years.

Our method is aimed at generating stylized facts and reveal regularities that are not immediately apparent by just looking at charts and descriptive statistics and we think the paper does deliver interesting observations based on this. However, we do not claim that this relatively simple method is capable of revealing the deep determinants of growth with strong presumptions about the direction of the causal chain. Just studying the descriptive statistics of the time series over the last 25 years reveals that to some extent fortunes have changed across the two main groups, the ten transition countries that entered the EU in 2004 and 2007 (EU10) and countries that came out of the dissolution of the Soviet Union, excluding the Baltic countries (FSU12). Since 2000 FSU12 has had a higher economic growth rate on average than the EU10 group. It is also worth noting that most of this comes from the four fuel exporting countries in the group, and this is so even though these countries according to most metrics have struggled with weak institutions during this time period, but this institutional weakness is dominated by the very strong growth in international oil prices that took place from 2001 to the onset of the global financial crisis. This doesn't necessarily refute the existing literature on the natural resource curse that often takes a longer perspective but it suggests that at least in this relatively short time horizon natural resources have been more a blessing than a curse. It is also worth noting that the higher growth rates in the latter part of our sample in the FSU12 group have been achieved despite lower levels of investments in physical capital, a main correlate with economic growth. Focusing instead on levels of income, though, reveals that this doesn't mean that FSU12 countries have converged to the initially higher level of income of the EU10 countries. Instead, the gap in 2015 is wider than in 1991, suggesting that the FSU12 countries are still paying the price of the economic collapse in the earlier years of transition.

Taking the analysis one step further and comparing predictions from the empirical growth model in LR92 with actual outcomes, and analyzing the residuals from such an exercise, generates several interesting observations. First, and tied to the debate on the region as "normal", the average residual for the whole group in the latter time period (2000-2015) is basically zero which stands in sharp contrast to a large negative average residual in the 1990s. In terms of growth performance this

[1] Transition is of course a multidimensional process that involves more dimensions than just economic growth that are important to the life of people in transition countries, including, inter alia, health, political freedom, rule of law, and corruption.

indeed suggests that the region as a whole now can be considered "normal", and that the phase of (economic) transition is long over. The aggregate data does of course hide substantial variation, though. As expected, the FSU12 has a much larger (in absolute terms) negative residual in the 1990's compared to the EU10 countries, but in the latter period the relative ranking reverses. Plotting individual country residuals in 1990-1999 against the residuals for 2000-2015 show a very clear negative correlation with most observations lined up on an almost straight line. What still keeps the difference in average growth rates in the 2000's quite small is that the EU10 countries have benefitted from higher investments in physical capital. Relative to capital levels, though, the EU10 group has clearly underperformed the expectations set by the standard model.

Secondly, we look at bivariate correlations between a set of commonly used explanatory variables in the empirical growth literature and both actual growth rates and our residuals from the LR92 model. Looking at among other factors different measures of institutions, macro-economic policies, human capital, size of government and reform progress we find that the signs of both unconditional and conditional (on LR92 fundamentals) correlations almost without exception flip signs between the early and late period. For a few variables, such as inflation, this may have an economic meaning, but generally this is difficult to square with any plausible explanation, suggesting that these correlations are not robust, subject to a structural break between the periods or simply irrelevant due to other more important forces at play at the time. It should be noted that many of these variables are likely to be correlated with some of the fundamentals of LR92, probably in particular investments in physical capital. Nevertheless, most of these variables are believed to have an impact also beyond capital accumulation, and the fact that we see a reversal of signs also in correlations with actual growth rates remedies this concern.

What do we then take out of these stylized relationships? Firstly, forces of mean reversion are strong. The EU10 countries entered year 2000 in a much better situation and has through the latter period benefitted from for instance stronger institutions (including democratic values and lower corruption), EU accession and a strong integration into the global value chain for manufacturing goods. Nevertheless, after the more substantial crisis of the 1990's, and in some cases clearly helped by raising world market prices on oil and gas, the FSU12 countries have benefitted from a higher economic growth rate in the 2000's. Secondly, the fundamental importance of avoiding deep crises is also evident in that the gap between the two regions is wider in 2015 than it was in 1991, despite the better performance of the FSU12 in the 2000's. Thirdly, the fact that the FSU12 has lower levels of investments in physical capital but much higher residuals relative to EU10 implies that there is a stark difference in the relative contribution to economic growth in the two regions in the 2000's. This suggests that going forward the main challenge of the former is to create an environment conducive to investments in physical (and to some extent human) capital whereas the main challenge for the latter is to increase the productivity of existing capital. Finally, from a methodological perspective, the comparative analysis of the two different time periods also tell a cautionary tale for over-emphasizing the influence of different explanatory variables based on data from limited time periods. In this particular case, such analysis if taken literally, would suggest completely opposite impact in the two different time periods at hand for a broad set of conventional growth regressors, including some institutional measures. One interpretation of the changing growth performance between the first and second period and lack of consistent correlations with institutional growth factors could be that the macroeconomic forces of mean reversion after a massive decline in output are so strong that they mask the importance of other factors that work over longer time periods. It could also be that the really important role of institutions is to reduce the decline in output when massive shocks hit rather than to increase growth rates by half a percent in more normal times.

Although these interpretations are consistent with what we observe here, they are by no means the only interpretations and these issues could be topics for future research.

The paper is structured as follows. In the next section we offer a review on parts of the vast literature on the experience, in particular in the area of economic growth, of the transition countries since 1990. In Section three we present the data we use and offer some descriptive preliminaries of what the data tells us. In Section four we present the LR92 model and make a comparative analysis of expectations versus reality across time periods and country groups. Then in Section five we introduce some additional growth determinants and correlate these with both actual growth data and the residuals from the LR92 model. Section six concludes.

Literature review

The end of communism in the eastern bloc and the break-up of the Soviet Union started a fundamental societal transformation. The transition from centrally planned command economies under one-party rule to democratic market economies has been uneven in pace and progress and it has given rise to an academic literature trying to understand the challenges and opportunities. Around year 2000, papers on the lessons learned from the first 10 years started to emerge, summarizing the process up to that point. For instance, in an influential paper published in the Journal of Economic Literature, Campos and Coricelli (2002) discussed the literature on short run economic growth in transition and offered a table with 7 stylized facts (the "magnificent seven"): "We summarize these ten years by means of a list of stylized facts of the transition so far, namely: (1) output fell, (2) capital shrank, (3) labor moved, (4) trade reoriented, (5) the structure changed, (6) institutions collapsed, and (7) transition costs." (Campos and Coricelli, 2002, p. 794.) This early literature offered some tentative suggestions for understanding the variation in both the magnitude of the initial output drop and in the speed and force of the following recovery.

At that time, there was little questioning that the region in the 1990s was facing huge challenges and special circumstances, even if there was an opportunity to possibly converge towards globally more normal economic and political systems. The region- specific academic debate was therefore often somewhat differently defined than the more general debate even when focusing on the same topic. Of particular relevance for this paper, this was certainly true when looking at the literature on economic growth. Based on the advancement of new economic growth theory, an empirical literature emerged in the early 1990's focusing on cross-country long run variation in economic growth, and its common determinants across a broad set of countries. The new developments sparked an explosion of papers and scholars experimented with a very wide set of different specifications and different sets of explanatory variables, what some referred to as kitchen-sink regressions, as scholars threw in "everything but the sink" into the equations. Attempts at consolidation where done, using different techniques to test for the robustness of specifications across different permutations of sets of explanatory variables (e.g. Levine and Renelt 1992, and Sala-i-Martin, 1997). More recently, the search for the "deep determinants" of economic growth have shifted focus to an even longer time horizon, with focus on slow moving norms such as culture, the historical influence of early institutions critical junctures, and the fate of geography (e.g. Acemoglu et al. 2001, Acemoglu and Robinson 2012, Gallup, Sachs, & Mellinger, 1998, Rodrik, Subramanian, & Trebbi, 2004, Gorodnichenko & Roland, 2016).

The early literature on growth in transition had a different focus. First of all, and for obvious reasons, it had a more short term focus, not just focusing on average growth but also trying to understand the variation in the initial output gap as well as the pace of the subsequent recovery. An example is given in Coricelli and Maurel (2011) where the transition experience is considered as an economic shock comparable to for instance financial crises, banking crises or civil wars. Comparing with the global experience of such shocks from 1960 to 2001 they find that the cumulative loss in GDP from the transition recession was greater (even twice as great in the case of the FSU countries) than even the average loss from civil wars. The duration was also longer than any other type of crisis. They then turn to an analysis of recovery, focusing on the level of growth the first year after return to positive growth rates arguing that a higher than average growth rate following a crisis is a necessary (but not sufficient) condition to return to pre-crisis trend growth rates. They find this condition to not be met in most types of crisis on average, but in particular so for the transition experience, suggesting that transition crisis recovery may be particularly challenging.

The literature also emphasized somewhat different key explanatory variables associated with the particular experience of an economic and political transition. In particular, much focus revolved around two sets of explanations: initial conditions versus reform progress. These explanations are multi-dimensional and not necessarily independent, in particular, reform progress may partly be a function of initial conditions. Factor analysis in Campos and Coricelli (2002) suggests that initial policy related distortions such as internal trade dependence, repressed inflation, and the black market premium on the currency market were important. These early distortions can be remedied over time and possibly compensated for, suggesting they may drop in significance in a longer time perspective (Berg et al., 1999). Equally important, though, were distance to Western Europe, time under communism and lack of independent statehood before transition. These factors are likely to be more difficult to overcome and compensate for in the longer term, and may thus have implications also for growth potential in the last 15 years.

With regards to reform progress, a big debate in the early transition literature concerned the optimal speed of reforms, shock therapy versus gradualism (e.g. Roland, 2000, and Havrylyshyn, 2007). Expressed as "a race between the tortoise and the hare" influential early proponents argued in favor of a gradual approach, often with support from the dual track approach in China (e.g. Stiglitz 2002 and Dewatripont & Roland, 1992). Meanwhile proponents of shock therapy suggest that history have shown them right, arguing that early and deep reformers made a quicker and more substantial recovery than their more gradual counterparts (Shleifer & Treisman, 2014, Åslund, 2012). After the initial momentum up until around 1997 there was also substantial variation in reform effort. In particular along the "2nd generation" types of reforms to the business environment, such as competition policy, corporate governance and restructuring and large scale privatization. While a few countries had gone quite far along most dimensions already early on and some countries (in particular on the Balkans) have shown a slow but steady improvement, many of the FSU countries remain at low levels close to where they were almost 20 years ago (IMF, 2014).

Early empirical papers also emphasized the importance of early reforms. In particular macroeconomic stabilization, but also structural reforms (at least with a lag) where found to be positively correlated with economic growth in early transition (e.g. Havrylyshyn and Al-Atrash, 1998, and Fischer et al., 1998). Subsequent studies trying to deal with the endogeneity of reforms to initial conditions suggest that reforms may indeed matter, but less so than initial conditions, and effects are diminishing as reforms progress (Falcetti et al., 2002, and Svejnar, 2002). As many other debates, conclusions depend partly on definitions (is China really a more gradual reformer than Russia?) and the role of alternative explanations (are initial conditions, geography and institutions properly

controlled for?). But it is hard to argue with the observation that the countries that made early and sustainable far-reaching reforms according to the EBRD transition indicators also did better early on than the group of countries that did not (though this of course says nothing about causality).

Meanwhile, papers like Campos and Coricelli, (2002) also pointed out that largely due to data limitations some potential key drivers where largely missing from the models in the early growth in transition literature. A key lesson from the literature is the importance of judicial, political and financial institutions that govern how markets function, how human and physical capital is allocated, how property and control rights are safeguarded and how corruption and organized crime are contained and punished (e.g. Roland, 2000, Popov 2000). The role of natural resources was also left largely unexplored. In particular oil and gas has the potential to drive economic growth in resource rich countries but it may also slow down reforms to the rest of the economy and feed corruption and autocratic tendencies (Roland, 2014, Cornia, 2010). Finally, the role of culture, as reflected in social norms, religion and values (sometimes referred to as slow-moving institutions) has also been emphasized recently in the literature. In particular the individualism-collectivism dimension has been found relevant for understanding the cross-country variation in income levels (Gorodnichenko & Roland, 2011; 2016). In the context of the transition experience, Roland (2014) argues that culture, through its impact on civil society and in turn democracy, can explain the variation we see across regions in the quality of economic institutions crucial for economic growth.[2]

A separate but related literature has recently emerged asking the question whether the unique experience of transition can be considered as over. Or put differently, should we now consider the region, and its countries, as "normal"? Two papers by Shleifer and Treisman (2005; 2014) make the argument that respectively Russia (2005) and the whole region (2014) should be regarded as normal in the sense that they are representative of typical countries, along a broad range of economic, social and political outcomes, at their level of income per capita. The negative judgement on Russia in particular, they argue, is based on the misconception that the country should be judged against the developed western democracies when in fact it is a typical middle income country in most respects.[3] In particular the paper on Russia sparked a lively debate, and dissenting voices have questioned perhaps in particular the political and institutional record of Russia and several of the other CIS countries, and argued that since the USSR was an abnormal middle income country in so many respects (performing much better than expected given its income level in terms of factors such as human capital, inequality and poverty, public service provision and crime and corruption) what to use as a relevant point of reference is far from clear (e.g. Popov, 2011).

Of particular relevance for this paper is whether the region over time has become more normal in terms of patterns of economic growth. Time series suggest that the cross-country variation in outcomes was substantially smaller in the time period 2000-2007, but then increased again in the wake of the financial crisis and its aftermath (IMF, 2014). Whether this implies normalcy, in terms of a convergence in mean and variance towards comparable countries and regions, is not clear, though, and requires more careful analysis. It is also quite clear that the underlying drivers of growth may differ substantially across countries in the region, not the least between countries rich in

[2] A link between democracy and economic reforms can be found also in for instance Giuliano et al. 2010 and Fidrmuc 2003 or Hellman 1998 for the case of the transition countries.

[3] At the time the paper was written there was much uncertainty with regards to the political direction of Russia. Unfortunately it has taken a turn to the worse, which already in the early paper was mentioned as a scenario though not considered the most likely outcome. In this particular respect, Shleifer and Treisman (2014) acknowledge that Russia has become less "normal" since 2005, but not according to most other outcomes, rather the opposite.

natural resources and those who are not, and it may also vary across time periods, in particular between more and less turbulent times. This has implications also for expectations moving forward, and the relative role of factor inputs and factor productivity. In the coming sections we suggest one approach to discuss normalcy and deviations from normalcy based on out of sample predictions from a parsimonious and robust growth model.

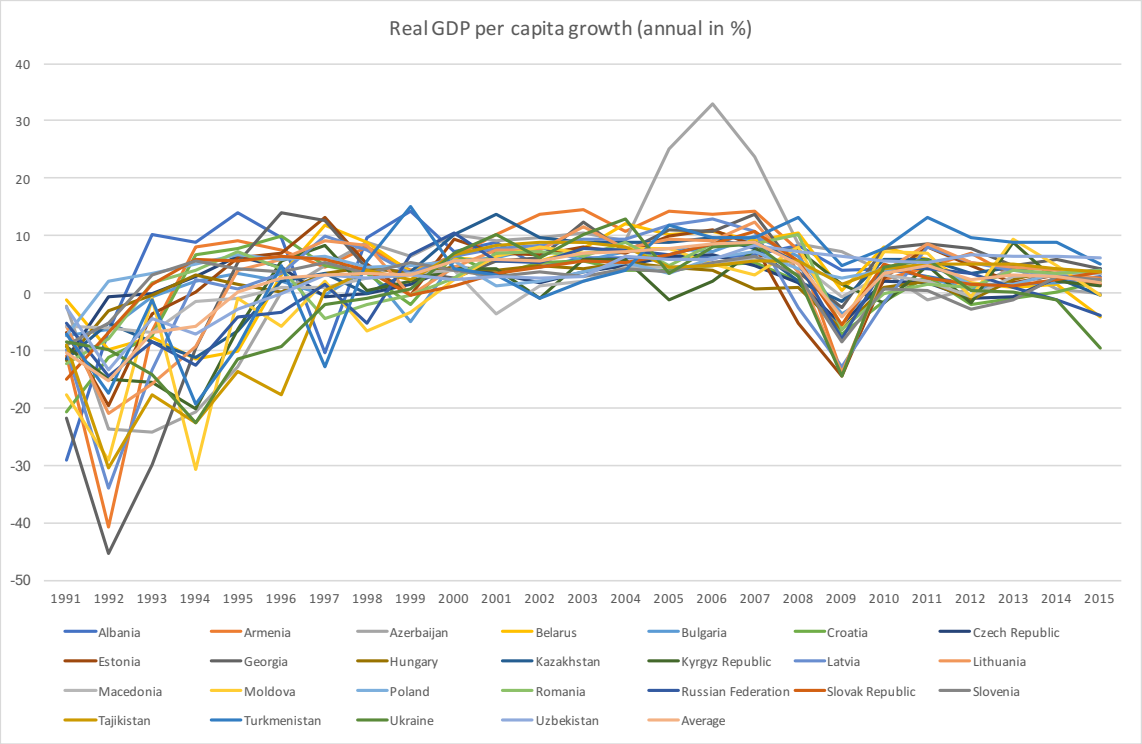
Data and descriptive statistics

The focus in this paper is the growth experience of 25 transition countries 25 years after the dissolution of the Soviet Union. The list of countries in alphabetical order is Albania, Armenia, Azerbaijan, Belarus, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Macedonia, Moldova, Poland, Romania, Russian Federation, Slovak Republic, Slovenia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan. We will generally take the dissolution of the Soviet Union in 1991 as our start year, as this works as a starting point of transition for most of the countries. For some countries though, Albania, Bulgaria, Hungary, Poland and Romania, transition started earlier and/or GDP declined significantly already in 1990. In tables showing numbers on income drops and average growth rates, we will therefore include this additional year for these five countries although table headings in general will state 1991 as the start of the sample.

There are different measures of growth available and here we use the World Bank's series on real per capita GDP growth. In some cases, the World Bank data is complemented with Penn World Table data for the initial years of transition to produce a full data set for all countries over the 25-year period. The exact details on all the data used in the paper are included in the data appendix. The data for the initial years of transition is subject to more uncertainty than later years, but this is unfortunately the case for alternative series as well.

The full growth experience of all 25 countries from 1991 to 2015 is shown in Figure 1. The picture of transition chaos in the first decade converging to something less turbulent in the following 15 years is quite striking. In the first phase all countries see their GDP decline, but the magnitude of the declines range from a few percent to more than 40 percent in a year in the worst country/year (Georgia in 1992). Note that the seeming convergence in growth in the more recent years is largely because the initial years of chaos make the scale in the chart so wide that 5-10 percentage point differences in growth in the later years look modest.

Figure 1: Growth 1991-2015



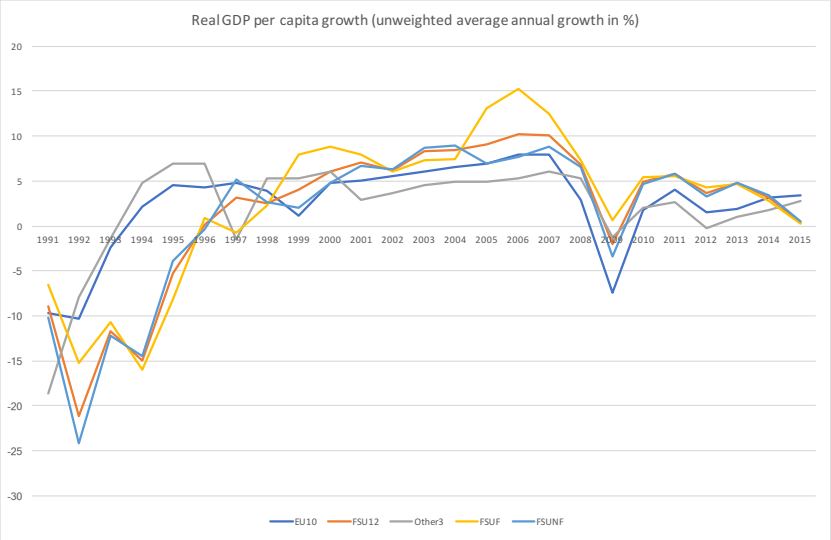
Source: Authors' calculations based on World Bank and Penn World Table data

Although each country is unique in some regards, we choose to group them together below to see if some more general features emerge in these groups. The first group consists of former Soviet republics, excluding the Baltic countries. This group, labeled FSU12, thus consists of Armenia, Azerbaijan, Belarus, Georgia, Moldova, Kazakhstan, Kirgizstan, Russia, Tajikistan, Turkmenistan, Ukraine and Uzbekistan. The second group consists of 10 transition countries that relatively early on signed association agreements with the EU before later joining the union and thus gets the label EU10. This group includes the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia that all joined the EU in 2004, together with and Bulgaria and Romania that joined the union in 2007. Croatia joined the EU in 2013, but since this is close to the end of our sample we include it in the "Other 3" group with Albania and Macedonia. We also break down the FSU12 group into the fuel and non-fuel exporters, where the first group includes Azerbaijan, Kazakhstan, Russia and Turkmenistan, and is called FSUF and the other eight FSU12 countries go under the heading FSUNF. We will make some points regarding the Other3 and FSU subgroups in the paper but the focus is on the differences and similarities between the larger FSU12 and EU10 groups.

Figure 2 shows the arithmetic mean growth rates for the different groups over the same period as in Figure 1. The figure shows clearly how much more severe the initial income drop was in the FSU12 group compared with both EU10 and Other3. Growth then turned positive in the EU10 group in 1994 whereas is took until 1996 before growth resumed in the FSU12 group. However, since 1999, the FSUF group has led in terms of annual growth in most of the years before 2014/15 when they were back to very low growth. This is mainly linked to the fall in international oil prices then which we will discuss in more detail later. Other external factors have clearly also been important for growth in the transition countries, with relatively high growth prior to the global financial crisis, negative growth in the crisis and then a return to growth at a lower level in the last part of the sample, in line with growth in much of the rest of the world. This is already a first sign that

these countries are “normal” in that they are affected by the same factors as other countries around the world.

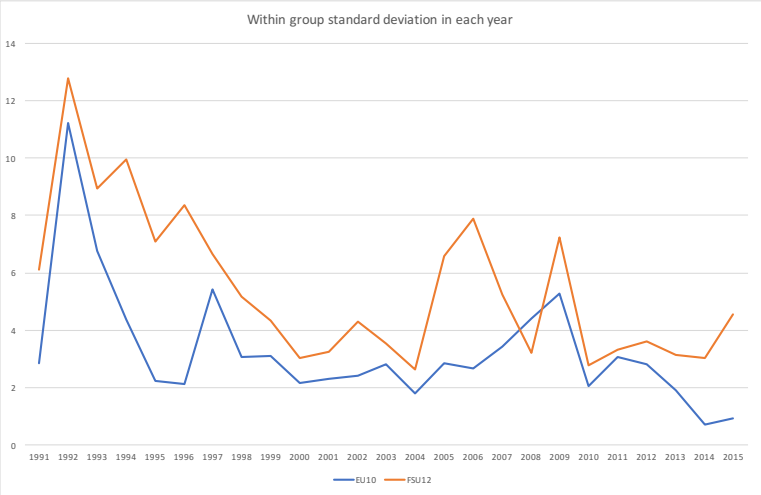
Figure 2: Country groups’ growth 1991-2015



Source: Authors’ calculations based on World Bank and Penn World Table data

Figure 3 gives an indication of how homogenous the growth experience has been within the two main groups as it plots the within group standard deviations for each year. The general picture is that the initial chaotic period was associated with much variation also within the groups but as growth rates have normalized, the within group standard deviations have fallen. The FSU12 group has not so surprisingly been more diverse than the EU10 group in all the years except in the year the global financial crisis started. The variance in the FSU12 group is not just driven by differences between the fuel and non-fuel exporting FSU countries and the picture for the sub-groups (not included here to reduce clutter) are very similar to the FSU12 aggregate. Furthermore, the “old” EU15 group of countries has a within group standard deviation of 1-2 percent over the same period, close to where the EU10 group is at the end of the sample.

Figure 3: Within country group differences in growth 1991-2015



Source: Authors’ calculations based on World Bank and Penn World Table data

Table 1 summarizes the growth experience for the groups for the full sample as well as the 10 early years and 15 later years that correspond to the chaotic first phase of transition and the relatively stable later phase respectively. For the full period, the average transition country has gone from economic decline in the first ten years of transition to relatively healthy growth in the last 15 years. The EU10 has shown a slightly higher growth rate than the FSU12 group for the full period but this hides the large swings in growth rates between the first and second part of the transition. Perhaps contrary to what some would expect, the EU10 group has not been growing more rapidly than the FSU12 or its sub-groups in the latter period so the higher growth rate for the full period comes entirely from not declining as much as the FSU12 group in the first part of transition. Note, though, that from a "risk to reward" perspective belonging to EU10 seems to be the better lottery ticket also for the whole period, as shown in the last columns of Table 1. A more structured analysis of the underlying growth factors that have contributed to this will follow below.

Table 1. Summary statistics on real GDP per capita growth (annual in %)

	Average			StDev			Avg/stdev		
	1991-2015	1991-1999	2000-2015	1991-2015	1991-1999	2000-2015	1991-2015	1991-1999	2000-2015
All 25	1.9	-3.1	4.7	7.7	9.3	4.3	0.2	-0.3	1.1
EU10	2.3	-0.5	3.9	5.9	7.4	4.2	0.4	-0.1	0.9
FSU12	1.6	-5.9	5.8	9.5	10.8	4.8	0.2	-0.5	1.2
FSUF	2.5	-5.1	6.8	9.3	9.4	5.7	0.3	-0.5	1.2
FSUNF	1.1	-6.2	5.3	9.7	11.5	4.3	0.1	-0.5	1.2
Other3	1.9	-0.5	3.3	6.5	9.6	2.9	0.3	-0.1	1.1

Source: Authors' calculations based on World Bank and Penn World Table data

The main reason we look at growth rates is that it changes income *levels* over time which we think is important for welfare. In many cases growth rates are positive and relatively modest and we do not spend so much time on how differences in annual growth affects income levels and welfare. However, the initial phase of transition was a very different period with large and *negative* growth rates and we summarize how much these negative growth rates early in transition affected income in Table 2. The first column shows the cumulative effect of the initial years of negative growth with income being cut in half in the FSU12 group while the EU10 countries on average lost 25 percent of their income. It took the FSU12 countries 6 years to hit their lowest income in the transition process, also this twice the 3 years it took for EU10 countries. Returning to pre-transition income levels was also a longer road for FSU12, with an average 19 years to recover while EU10 countries needed 11 years. Although the vast majority of the literature looking at long term determinant of income focus on factors that generate growth there has been papers discussing declines in output (e.g., Becker and Mauro, 2006) and to what extent countries tend to return to pre-crisis trends (e.g., Cerra and Saxena, 2008). It is obvious in this context that limiting the decline in income rather than generate growth is central to the transition process and understanding where country incomes are today, 25 years after the dissolution of the Soviet Union.

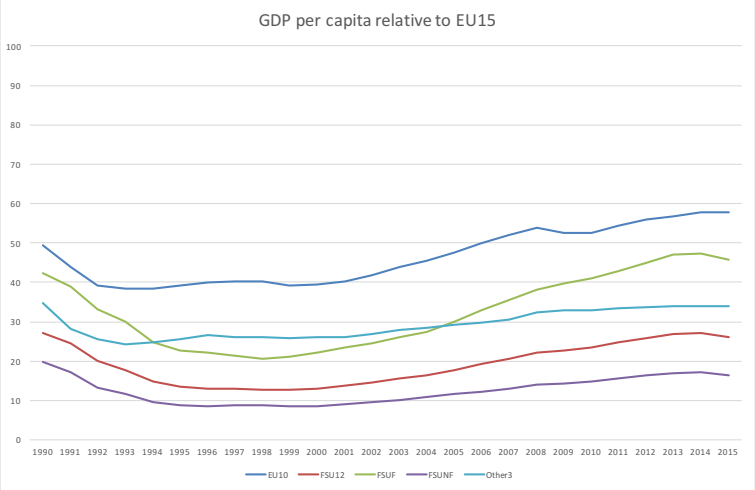
Table 2. Income levels in transition

	Initial declince in GDP (% of initial GDP)	Years to bottom	Years to recover
All 25	-38	5	15
EU10	-25	3	11
FSU12	-51	6	19
FSUF	-47	6	16
FSUNF	-53	6	21
Other3	-29	4	12

Source: Authors' calculations based on Penn World Table data

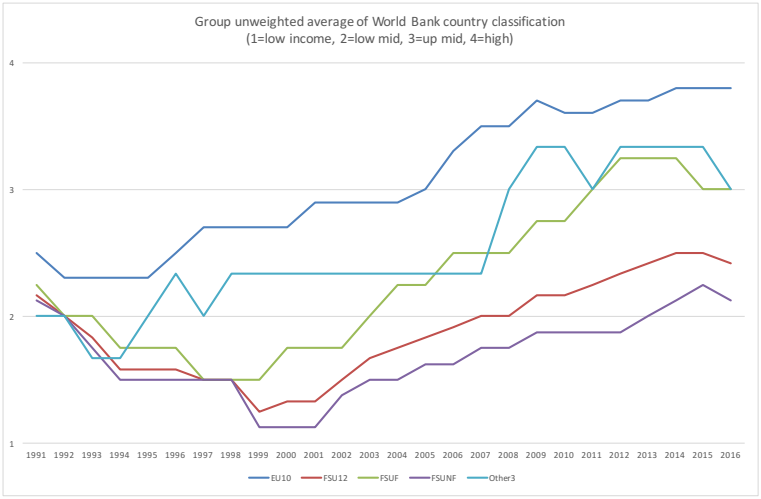
There is also the question of catching up with high income countries and Figure 4 shows how transition countries' income levels compare with the "old" EU members (EU15). The first thing to note is that the ten countries that ended up in the EU were on average significantly richer at the onset of transition than the average FSU12 country at around 50 percent of EU15 incomes compared to less than 30 percent. The fuel exporting group of the FSU countries were significantly better off than the non-fuel exporters with income at over 40 percent of the EU15 rather than 20 percent. However, the initial phase of transition saw all groups falling further behind the average EU15 country and at the low point the FSU12 group had only 13 percent of the income in the average EU15 country while the EU10 countries kept themselves around 40 percent of EU15 incomes. The new millennium saw the EU10 countries eventually catching up and surpassing their relative income level at the start of transition and reaching almost 60 percent of EU15 income in 2015. However, the average FSU12 country is just barely back at the less than 30 percent of EU15 incomes that they started off the transition process with. The variation within the FSU12 group is significant though as the fuel exporters almost reach 50 percent while the non-fuel exporters do not reach 20 percent of EU15 incomes in 2015. This is certainly a bit different from the standard natural resource curse story.

Figure 4. Catching up with the old EU countries



Source: Authors' calculations based on World Bank and Penn World Table data

Figure 5. World Bank income group classifications



Source: Authors' calculations based on World Bank data

The other issue related to income levels is if transition countries have been stuck in low or middle income traps. Figure 5 shows the arithmetic means for respective groups using a numerical conversion of the World Bank's income classification. First, it again shows that there were some, but relatively small, differences between the groups at the onset of transition (when almost all the countries were low middle income according to the World Bank) but at the end of the first ten years of transition the groups had diverged dramatically with the FSU12 group falling in the low-income category while the EU10 had moved up to the high middle income category. In 2015, the EU10 group is most close to the high-income category while the FSU12 is between the lower and upper middle income category. However, there is no sign that the transition countries are stuck in transition when it comes to income or in a low or middle income trap. Even if transition is a slow process, significant progress has been made almost across the board in the last 15 years, at least when it comes to income. In the next section, we take a model-based approach to address the question if transition countries now can be regarded as "normal" in terms of economic growth.

Transition growth versus a regular growth model's predictions

The charts and descriptive statistics above give some indication of a transition process with two relatively distinct phases; a first period of falling incomes and turmoil followed by the last 15 years of more regular patterns. In addition to providing regular charts and tables on actual growth, however, we also want to understand if growth in transition countries seem to be governed by the same or other factors than the ones identified in the general cross-country growth literature. This also addresses the growth part of the question if transition is over and if we can regard transition countries as "normal" countries (Shleifer and Treisman 2005 and 2014). The empirical strategy used here follows closely the analysis that was done in the EBRD's Transition report in 1997, which uses the model estimated by Levine and Renelt (1992, equation 2 on page 946) to generate predicted growth rates for transition countries very early in the transition process to assess if countries reached their projected growth potential. The estimated regression is

$$GYP = -0.83 - 0.35 initalGDP - 0.38 pop.growth + 3.17 sec.school + 17.5 inv/GDP$$

where growth in real GDP per capita (GYP) is regressed on initial GDP, population growth, secondary schooling and the ratio of investments to GDP. The estimated regression has a negative sign on the coefficients for initial GDP and population growth, which suggests that there is conditional convergence and that population growth leads to lower GDP per capita growth. Investments in both human capital (in the form of increased secondary schooling) and physical capital (measured by the investment to GDP ratio) contribute positively to growth. These estimates are consistent with standard predictions in the growth literature and we think it still serves as a good first benchmark to evaluate growth in transition countries. There are of course many other papers that estimate growth regressions with different variables, countries and time periods but we want to use the same model as in the EBRD paper to see how their early analysis holds up after an additional 20 years of growth data. In addition, Levine and Renelt end up with this specification after a very careful analysis of robustness where all the other variables that were subjected to their robustness test failed. Most of the analysis in the paper is done for a sample of 119 countries between 1974 and 1989, although some data from as early as 1960 is used in part of their study.

We may worry that the world economy experienced very different growth in this period compared with the periods that we look at below[4]. At the world level, growth has fallen around half a percentage point from a sample that starts in the late sixties and end in 1989 compared with the period 1991-2015.However, for low and middle income countries, growth has instead increased by more than half a percentage point, while the European union saw the growth falling by almost 1.5 percentage points between those time periods. To the extent that a change in the global growth environment simply produce a different intercept in the equation, all our countries are affected in the same way, so the comparisons between different groups are not affected. It would be more problematic if the marginal effect from the different explanatory variables change over time, but this methodology is clearly based on the assumption that this is not the case. The same Also, when we look at the estimates in other papers, they often include a larger set of explanatory variables (which raises the issue of robustness) and/or include the countries we want to make out-of-sample predictions for.

Having collected the relevant data for all the 25 transition countries we can compute the models predicted growth for each country by using the above coefficients and construct the residuals for individual countries by taking the actual growth rates and deduct the models predicted growth.[5] The residuals for the groups are then calculated as unweighted averages. Tables 3-5 shows the result of this exercise for the full period, the initial ten years and the last 15 years. The tables also include the effect the different explanatory variables have on predicted growth to allow us to understand what drives the differences in predicted growth between the groups and over time.

The first observation in Table 3 is that as a group, growth in transition countries over the full 25-year period was well below what the model would predict based on the average levels of initial income, population growth, secondary schooling and investments to GDP. While the model predicted average growth close to 4.5 percent, actual growth did not reach 2 percent with a resulting residual of 2.5 percent. This may not sound much but for 25 countries, underperforming by 2.5 percent per year for 25 years is an enormous loss of income affecting the lives of hundreds of millions of people. The residual for the full period is similar for the EU10 and FSU12 countries even though the former has had a faster growth rate since EU10 also had higher expected growth mainly due to a higher investment to GDP ratio. We can also note that in general, investments in human and physical capital

[4] In the appendix, we include a table that shows how growth across different country groups have varied over time.
[5] All the data is defined in the appendix.

are the two most important factors numerically, but since the variance in schooling is very small it plays little role in explaining variation across the groups. Instead the group differences come from investments in physical capital and to some extent from catch up growth in the sense that the richer EU10 group gets around half a percent *less* of expected growth on this account compared to the FSU12 countries. Within the FSU group, the fuel exporters are expected to outperform growth among the non-fuel exporters by around 1 percentage point. This comes from much higher investments among the fuel exporters, as substantial investments were needed to extract natural resources. Although FSUF countries also underperform the model, their growth was 1.5 percentage points higher than their FSU peers and the smallest residual of all country groups over the full sample. Again, not exactly an indication of the natural resource curse in terms of growth.

Table 3. Model predictions for the full sample, 1991-2015

	1991-2015	1991	1991-2015	1991	1991-2015	1991-2015	1991-2015	1991-2015
	constant	initlal GDP	pop growth	sec school	inv/GDP	predicted	actual	residual (a-p)
	Variable averages							
All 25	1.00	2.40	0.00	0.92	0.18	4.39	1.88	-2.51
EU10	1.00	3.24	-0.41	0.94	0.21	4.88	2.27	-2.60
FSU12	1.00	1.80	0.42	0.92	0.15	3.89	1.56	-2.33
FSUF	1.00	2.59	0.72	0.91	0.20	4.40	2.51	-1.89
FSUNF	1.00	1.40	0.26	0.92	0.12	3.63	1.08	-2.55
Other3	1.00	2.03	-0.25	0.87	0.20	4.77	1.88	-2.89
	Impact on predicted growth							
All 25	-0.83	-0.84	0.00	2.91	3.15			
EU10	-0.83	-1.14	0.16	2.97	3.72			
FSU12	-0.83	-0.63	-0.16	2.91	2.59			
FSUF	-0.83	-0.91	-0.27	2.89	3.52			
FSUNF	-0.83	-0.49	-0.10	2.92	2.13			
Other3	-0.83	-0.71	0.09	2.75	3.47			

Source: Authors' calculations based on World Bank and Penn World Table data

In the previous section, we have seen the stark difference between the growth performance in the initial phase of transition compared with the later phase. The question here is if this could be explained by large changes in the explanatory variables that enter the regular growth model of Levine and Renelt or if there is also a large difference in terms of the residuals that come out from the model's prediction relative to actual growth. Table 4 answers this very clearly. The residuals in the initial phase of transition were very large which implies that the early phase of transition did not look like growth in a regular model but underperformed this by a wide margin. Instead of a predicted growth of around 4 percent, actual "growth" was on average a decline of 3 percent resulting in a 7-percentage point underperformance per year and country. The difference between the EU10 and FSU12 was also very substantial with the EU limiting underperformance to around 5 percentage points while growth in the FSU12 group was almost 10 percentage points worse than the model predicts. In this phase of transition, the residuals in the two FSU groups were similar, while the Other3 group had the smallest residual of around 4 percentage points.

Table 4. Model predictions for the initial phase of transition, 1991-1999

	1991-1999	1991	1991-1999	1991	1991-1999	1991-1999	1991-1999	1991-1999
	constant	initlal GDP	pop growth	sec school	inv/GDP	predicted	actual	residual (a-p)
	Variable averages							
All 25	1.00	2.40	-0.06	0.92	0.16	4.05	-3.06	-7.11
EU10	1.00	3.24	-0.41	0.94	0.18	4.25	-0.45	-4.71
FSU12	1.00	1.80	0.30	0.92	0.15	3.98	-5.88	-9.86
FSUF	1.00	2.59	0.57	0.91	0.21	4.66	-5.14	-9.79
FSUNF	1.00	1.40	0.17	0.92	0.12	3.64	-6.25	-9.89
Other3	1.00	2.03	-0.38	0.87	0.13	3.61	-0.48	-4.09
	Impact on predicted growth							
All 25	-0.83	-0.84	0.02	2.91	2.78			
EU10	-0.83	-1.14	0.16	2.97	3.10			
FSU12	-0.83	-0.63	-0.12	2.91	2.65			
FSUF	-0.83	-0.91	-0.22	2.89	3.72			
FSUNF	-0.83	-0.49	-0.07	2.92	2.11			
Other3	-0.83	-0.71	0.14	2.75	2.26			

Source: Authors' calculations based on World Bank and Penn World Table data

In terms of different growth factors, it is interesting to note that the FSUF group has the highest level of investment to GDP as they are developing their capacity to extract natural resources, with almost double the ratio of the FSUNF and Other3 groups and also ahead of the EU10 group. However, this was a period with relatively low international oil prices, which meant that the investments in the FSUF group did not deliver actual growth that was in line with the model prediction, but instead underperformed at the same level as FSUNF countries. In sum, this was not a period when the transition countries on average could be considered "normal" in the way they were growing.

In the later phase of transition, the result changes dramatically as can be seen in Table 5. The average residual is almost exactly zero, which is to say that the 25 transition countries grow precisely as the model would predict given income levels, population growth, secondary schooling and investment to GDP ratios. In other words, when it comes to economic growth performance, the transition countries as a group are now "normal" countries! There are still differences among the groups, and the EU10 and Other3 groups are still underperforming relative to the model's predictions at the rate of 1.4 and 2.2 percentage points respectively. This is then offset for the full set of countries by the FSU12 group that is over-performing the model's predicted growth by 1.8 percentage points. The differences in residuals between the EU10 and FSU12 groups is a result of both higher expected growth for the EU10 group, largely due to higher investments to GDP, and actual growth being almost 2 percentage points lower in the EU10 group compared with the FSU12 group. The FSU12 group would be expected to have around half a percentage point faster growth due to catch up growth given the differences in initial income, but the EU10 group should have 1.5 percentage points higher growth due to its higher investment ratio according to the model. The strongest over-performance is delivered by the FSUF group, that benefitted from very strong growth in international oil prices between 2001 and 2008.

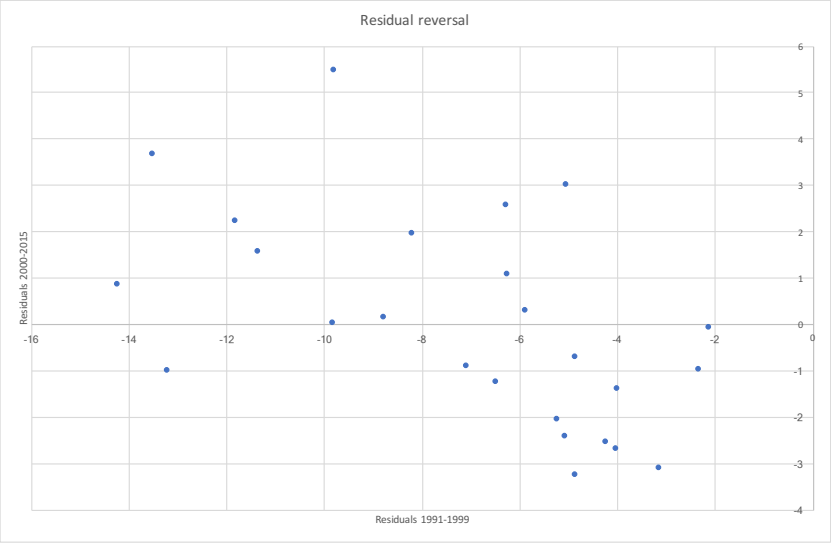
Table 5. Model predictions for the later phase of transition, 2000-2015

	2000-2015	2000	2000-2015	2000	2000-2015	2000-2015	2000-2015	2000-2015
	constant	initlal GDP	pop growth	sec school	inv/GDP	predicted	actual	esidual (a-p)
	Variable averages							
All 25	1.00	1.80	0.04	0.88	0.19	4.70	4.72	0.02
EU10	1.00	2.81	-0.42	0.91	0.23	5.31	3.87	-1.44
FSU12	1.00	0.96	0.48	0.88	0.15	3.99	5.79	1.80
FSUF	1.00	1.49	0.81	0.89	0.19	4.56	6.81	2.25
FSUNF	1.00	0.69	0.31	0.87	0.12	3.71	5.28	1.57
Other3	1.00	1.85	-0.17	0.85	0.24	5.49	3.26	-2.22
	Impact on predicted growth							
All 25	-0.83	-0.63	-0.02	2.81	3.37			
EU10	-0.83	-0.98	0.16	2.87	4.09			
FSU12	-0.83	-0.33	-0.18	2.77	2.56			
FSUF	-0.83	-0.52	-0.31	2.82	3.40			
FSUNF	-0.83	-0.24	-0.12	2.75	2.14			
Other3	-0.83	-0.65	0.06	2.71	4.19			

Source: Authors' calculations based on World Bank and Penn World Table data

As expected, variation is even greater across individual countries. One interesting observation regarding the residuals for the individual countries is that there seem to be a degree of mean reversion in the sense that when we plot the residuals from the first phase of transition against the residuals of the latter part of transition in Figure 6, there is a clear negative relationship. The periods are too long for this to be a regular cyclical variation but the worst performers in the group in the first phase are almost without exception among the best performers in the second phase. The next question to address is if there are institutional and other variables that help explain the variation in residuals among the countries.

Figure 6. Residual mean reversal between the early and late transition phases



Source: Authors' calculations based on World Bank and Penn World Table data

Other potential growth factors in transition

The model we have used to evaluate the growth performance of transition countries is parsimonious which has several advantages such as being robust and not requiring extensive data sets that are not available for all the countries during the transition process. However, the small set of variables used in the model raises the issue of what other factors may be correlated with the growth history of the transition countries. The empirical growth literature is vast and so is the number of possible variables to include in a growth regression. In this section, we will focus on some of the factors that have received special attention when it comes to the transition process. The methodological approach is to see if the country-specific growth rates and residuals that we obtain in the previous section are correlated with other factors one-by-one. In other words, we look at both the unconditional and conditional correlations between these variables and growth once we have accounted for the factors that are part of the Levine and Renelt model. The reason to look at bivariate correlation instead of including all variables in one regression to see what "survives" is that there are too many possible variables to include in such regression compared to the number of observations.

A natural starting point is the role of institutions. One of the primary lessons from the transition experience was the importance of market supporting legal and political, but also more informal, institutions in order for markets to function efficiently and allocate the benefits of trade of goods and services in a reasonably equal way. In the absence of institutions that protect property rights, foster fair market competition and safeguard from excessive corruption and state capture, incentives for investments in both physical and human capital is thought to go down, and inequality is thought to increase. As discussed above, institutions have also subsequently garnered much attention in the more general literature on economic growth and development, nowadays referred to as one of the "deep determinants" of economic development. The question is then what we mean by institutions and how we measure them in a way that is relevant for empirical growth studies. Knack and Keefer (1995) and Knack (1996) are some early examples of papers that include institutions in growth regressions and they use the International Country Risk Guide (ICRG) index of property rights which is compiled by the commercial data provider Political Risk Service. Corruption and democracy are two other institutional variables that could influence property rights and investor confidence which in turn can affect growth (see, e.g., Rodrik 1997, Tavares and Wacziarg, 2001, Acemoglu et al., 2014, Mauro, 1995). In much of the earlier literature on democracy and economic reforms, the former was often seen as an impediment to the political ability to implement necessary economic reforms with long run benefits for economic growth but short run costs. In the context of transition it was argued that the critical challenge was to overcome the "valley of transition", and in a competitive democracy short term losses may not be accepted by myopic voters uncertain about the long term benefits so it would be wise to do economic reforms first, and political reforms later (Przeworski 1991). The experience of the transition countries in the 1990's seemed to upend that logic, though, and it was instead argued that political reforms can facilitate a full economic reform agenda, overcoming resistance from economic elites benefitting from only partial reforms (Hellman, 1998). The transition experience thus contributed somewhat to a revision of the role of democracy for economic policies and in the end economic growth.

Table 6 shows the conditional (residual) and unconditional (actual) correlations between the institutional variables and growth. The first thing to note is that measures of institutional quality are in many cases not available for the transition countries in the earliest years of transition. The ICRG

index is for example only available for five countries in 1991, while the measure of control of corruption only starts in 2000. The only exception is the measure of democracy which is available for all countries since 1991. The lack of data for the early days of transition is problematic since we would like to look at initial conditions to the extent possible to reduce the problem of endogeneity if institutions change because of economic growth rather than the other way. However, if we think institutions are slow to change, later measures of institutions may be highly correlated with initial conditions (Acemoglu et al. 2001). Nevertheless, it should be clear that the correlations with the ICRG indices in Table 6 are based on a very small subsample of countries in the early years and that this subsample changes over time.

In general, the correlations are not stable across the different time periods, and in almost all cases the sign of the correlations change between the first and second phase of transition. This is perhaps not so encouraging for those looking for robust, long-run, correlates of growth, but it is consistent with the findings above that the growth experience and residuals are very different in the first and second phase of transition, especially when we compare the EU10 group with the FSU12 group. Given that the institutional factors move relatively slowly, it is not surprising that the correlations change sign between the early and late period of transition. This is also the case for the democracy indicators that is available for all the countries in all of the years, so it is not just an effect of changing the country composition between the time periods. Although the conditional and unconditional correlations are not the same when looking at the full sample period, they are very similar when we look at the subsamples representing the first and second phases of transition, so the general pattern of changing signs is not affected by conditioning.

Table 6. Institutional variables

	ICRG index			ICRG rule of law			Control of corruption			Democracy		
	1991	1995	2000	1991	1995	2000	1991	1995	2000	1991	1995	2000
Average	31.06	35.60	28.30	0.66	0.86	0.69	…	…	-0.40	0.47	0.58	0.60
N. Obs	5	8	19	5	8	20	0	0	25	25	25	25
Correlation 1991-2015												
Residual	0.23	0.34	-0.26	-0.13	0.26	-0.33	…	…	-0.13	-0.14	-0.31	-0.34
Actual	-0.43	0.12	-0.11	-0.66	0.31	-0.34	…	…	0.19	0.01	0.03	0.01
Correlation 1991-1999												
Residual	0.31	0.59	0.42	-0.51	0.28	-0.15	…	…	0.65	0.23	0.54	0.48
Actual	0.31	0.65	0.45	-0.58	0.26	-0.11	…	…	0.68	0.22	0.55	0.49
Correlation 2000-2015												
Residual	-0.26	-0.52	-0.61	0.66	-0.09	-0.21	…	…	-0.65	-0.32	-0.72	-0.70
Actual	-0.87	-0.74	-0.59	0.39	-0.01	-0.26	…	…	-0.56	-0.24	-0.59	-0.54

Source: Authors' calculations based on PSR, World Bank and Penn World Table data

Different measures of how populations change and human capital have also been included in for example Barro's (2015) general growth regressions while the importance of market-oriented reforms are often discussed for transition countries. In Table 7, the conditional and unconditional correlations between these variables and growth are shown for different time periods. There are some very strong correlations in the table, but again, the sign of the correlations change between the early and late phase of transition. Even if the correlations are high, it is hard to come up with credible explanations to, e.g., why a higher life expectancy or market reform ranking is good for growth in the early transition period but very detrimental to growth in the later period, which is what the correlations seem to imply. And again, this is the case both for conditional and unconditional correlations.

Table 7. Human capital and reform variables

	Life expectancy			Fertility			Femal school years			EBRD index		
	1991	1995	2000	1991	1995	2000	1991	1995	2000	1991	1995	2000
Average	69.09	68.57	70.06	2.38	1.98	1.69	8.92	9.59	10.18	8.95	16.76	18.77
N. Obs	25	25	25	25	25	25	19	19	19	25	25	25
Correlation 1991-2015												
Residual	-0.28	-0.15	-0.10	0.36	0.32	0.31	0.11	-0.01	-0.01	-0.12	-0.26	-0.30
Actual	0.09	0.18	0.25	-0.08	-0.12	-0.11	0.17	0.08	0.14	0.09	-0.09	-0.12
Correlation 1991-1999												
Residual	0.68	0.73	0.76	-0.39	-0.37	-0.36	0.21	0.16	0.23	0.68	0.57	0.43
Actual	0.68	0.71	0.73	-0.46	-0.45	-0.44	0.27	0.24	0.32	0.67	0.54	0.37
Correlation 2000-2015												
Residual	-0.77	-0.69	-0.68	0.64	0.60	0.59	-0.09	-0.20	-0.27	-0.69	-0.70	-0.61
Actual	-0.66	-0.59	-0.53	0.42	0.37	0.38	-0.18	-0.28	-0.30	-0.67	-0.73	-0.56

Source: Authors' calculations based on Barro-Lee, EBRD, World Bank and Penn World Table data

Barro's growth regression also includes the size of the government, openness, and macroeconomic factors such as inflation and terms of trade changes. These are also variables that have been discussed in the transition literature and Table 8 shows the conditional and unconditional correlations of these variables and growth. In line with what has been observed in Table 6 and 7, the correlations change sign between the first and second phase of transition in every case in Table 8. There is also little difference between the conditional and unconditional correlations across the table.

One variable that is not available for the first period of transition is changes in terms of trade, but we can note that there is a strong positive correlation between both conditional and unconditional growth and changes in terms of trade in 2000-2015. This is no surprise given how important oil has been in explaining growth in Russia as has been shown in the simple growth regressions presented in Becker (2017).Around two thirds of GDP growth in 2000-2015 can be accounted for by changes in international oil prices. In the appendix, we have done the same type of regressions for the other FSUF countries, that all display a positive and significant correlation between growth and changes in international oil prices, where Russia stands out as the country most affected by variations in international oil prices. The direct effect international oil prices have on the FSUF countries also spill over to the FSUNF countries via trade, remittances and financial flows. For example, Tajikistan had remittances from Russia in the order of 40 percent of GDP on average in the period 2006-2015, while Belarus' export to Russia was in the order of 20 percent of the country's GDP in the same period.

Table 8. Economic structure and macro variables

	Govt/GDP			Openness			Inflation							Terms of trade change
	1991	1995	2000	1991	1995	2000	1991	1995	2000	1991-99	2000-15	1991-2015	1995-2015	2000-2015
Average	0.33	0.36	0.28	0.19	0.28	0.41	127	194	19	288	7	94	24	0.81
N. Obs	25	25	25	25	25	25	5	23	25	25	25	25	25	25
Correlation 1991-2015														
Residual	0.18	0.16	0.19	-0.34	-0.35	-0.25	-0.19	0.23	0.03	0.24	0.07	0.24	0.12	0.41
Actual	-0.19	-0.35	-0.02	-0.06	-0.02	0.08	-0.24	0.07	-0.01	0.08	-0.11	0.08	0.02	0.35
Correlation 1991-1999														
Residual	-0.38	-0.62	-0.11	0.42	0.44	0.41	-0.56	-0.49	-0.11	-0.44	-0.32	-0.44	-0.41	-0.17
Actual	-0.46	-0.70	-0.12	0.46	0.48	0.47	-0.71	-0.42	-0.07	-0.37	-0.29	-0.37	-0.34	-0.10
Correlation 2000-2015														
Residual	0.56	0.64	0.18	-0.63	-0.68	-0.59	0.32	0.57	0.13	0.53	0.33	0.53	0.43	0.49
Actual	0.33	0.39	0.09	-0.61	-0.59	-0.45	0.38	0.55	0.06	0.50	0.20	0.49	0.41	0.52

Source: Authors' calculations based on IMF, World Bank and Penn World Table data

In some cases, we could come up with explanations why the change in signs between the periods makes sense. For example, the fact that high inflation led to low growth in the early phase of transition but high growth in the later sample could be a result of inflation going from several hundred percent in the early period to single digits in the later period so the early correlation reflects massive uncertainty in local currencies which reduce growth while the latter reflects inflation being high in countries with a high level of economic activity. This would be consistent with a non-linear relationship between the variables or a structural break between the first and second phase of transition. We are aware that this is only a display of correlations and not a deep exploration of causal relationships, however, for anyone who want to understand the importance of different factors for growth in transition countries, there has been a very important structural shift between the first ten years of transition and the later 15 years that must be addressed in empirical studies of the subject.

Conclusions

Many studies took stock of the transition experience at the 10 year mark around the turn of the century, suggesting that there was still ground to cover before the region could be considered to be on track. In this paper we wanted to take stock 15 years later (and 25 years after the dissolution of the USSR) of progress in one key dimension, economic growth. As also argued in Shleifer & Treisman (2014), we find that the region as a whole in this respect indeed seems "normal" at this point, i.e. it very well conforms to what one would expect given the status of fundamental growth determinants. Beyond the aggregate, though, we also find substantial variation both across groups of countries and over time. First, we find that the countries of the former Soviet Union except the Baltic countries (FSU12) have been growing faster than the 10 countries joining the EU 2004 and 2007 (EU10) in 2000-2015 despite that the latter group has in almost all respects benefitted from better growth conditions. This is partly driven by increasing international oil prices up until 2008 but it also points to the strength of fundamental forces of mean reversion at play in the short to medium run, as the FSU12 was also much more severely affected by the turmoil of the first decade of transition. This finding is bolstered by the very clear pattern that countries that under-performed particularly much relative to expectations from a basic growth regression in the 1990's also have been the ones most over-performing expectations in the latter period. Second, we find that correlations between unconditional or conditional (on a set of fundamental growth determinants) growth rates and a set of commonly used growth regressors capturing strength of institutions, economic policy and human capital look fundamentally different depending on the time period under study. This doesn't necessarily refute the emphasis in the early literature of the importance of many of these factors for the relative performance in the 1990's. But, at a minimum, it suggests that the role of these factors may be substantially weaker in the latter period of recovery and that more fundamental macroeconomic forces may play a larger role. Third, we find that the growth challenge looking ahead seems to be quite different for the two regions. In FSU12 the key challenge seems to be to create an environment conducive to increased capital investments, in particular in non-fuel exporting countries. In EU10 (with higher rates of investments) the key challenge rather seems to be to increase the productivity of the investments made.

Our purpose of this analysis has been to learn more about the recent growth experience of the transition countries, but some of the findings may carry some implications also beyond the region. Despite the higher growth rate in the 2000-2015 period, the FSU12 countries are still farther away from the CEE countries in GDP per capita levels today than they were at the onset of transition in 1991. This points to the importance of avoiding deep crises and suggests how difficult it is to make it up. Also, the seemingly reversed role of many common growth regressors between the two time periods suggests that one needs to be cautious about drawing strong conclusions based on findings over limited time periods, in particular in samples of countries undergoing substantial change or in periods when there are strong external and internal macro-economic forces at play, such as massive terms of trade shocks or mean reversion due to domestic boom-bust cycles. Positive correlations in one time period may be negative in the next, and close to zero if taken over both. Findings from the literature on the deep determinants of economic development, which typically take a very long term perspective, may thus not carry over so easily to analysis of more medium term developments. Finally, although we claim that the average transition country now is "normal" in terms of economic growth, the underlying mechanisms and deeper growth determinants that generate the variation between individual transition countries have not been uncovered here. Furthermore, we have only focused on economic growth and as suggested in Shleifer and Treisman (2014) there are many additional dimensions to consider before anyone can claim that transition is completely over and countries are "normal" in a more general sense.

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Appendix

Data definitions and sources

The data that has been used in this study is defined below. Many of the series are from the World Bank's World Development indicators database that is available at https://data.worldbank.org/products/wdi and the series used here were downloaded at different times during 2016 and 2017.

Growth in real GDP per capita. World Bank series NY.GDP.PCAP.KD.ZG which is annual percentage growth rate of GDP per capita based on constant local currency. The data has been complemented with Penn World Table 9 (PWT) data where this is missing in the World Bank data set. For Croatia, Estonia, Latvia, Lithuania, Poland and Slovenia this is for the years 1991-1995, for Slovakia 1991-1992, and for Hungary in 1991. The PWT growth rates are based on the variables rgdpna (real GDP at constant 2011 national prices in mil. 2011US$) divided by pop to get GDP per capita which is then used to calculate the annual growth rates of GDP per capita.

Income levels. Calculations in Table 2 are unweighted group averages based on PWT series rgdpna divided by PWT series pop.

GDP per capita relative to EU15. Calculations in Figure 4 are based on the World Bank series NY.GDP.PCAP.PP.KD, which is GDP per capita in PPP terms (constant 2011 international $). Group averages are divided by the EU15 group, which consists of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Ireland, Luxembourg, Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

Income group classifications. This is based on the World Bank's analytical classifications that is presented in the World Development Indicators. The scale has four steps, low income, lower middle income, upper middle income, and high income that are based on GNI per capita in USD (Atlas methodology) with thresholds that change over time. The scale has been translated into numerical values 1 to 4 which are then used to calculate the group averages that are shown in Figure 5.

Initial GDP. Levine and Renelt (1992) use real GDP per capita in 1960 from Summers and Heston, which is based on 1985 international dollars. Since this data is not available for the countries and years used here, the equivalent initial GDP is computed by using relative income to the US in later years scaled back to 1960 by using 1960 GDP per capita for the US in 1985 dollars (which was 9634). This calculation is done with the World Bank series NY.GDP.PCAP.PP.CD which is GDP per capita in PPP terms (current international $). Also note that in the LR regression, country incomes are measured in 1000 dollars (while the PWT and World Bank GDP per capita data is simply dollars).

Population growth. Annual population growth (in %) is the World Bank series SP.POP.GROW.

Secondary schooling. Gross enrolment ratio in secondary school, both sexes (in %) from the UNESCO Education dataset available at http://data.uis.unesco.org.

Investments to GDP. The series csh_i, which is the share of gross capital formation at current PPPs from the PWT.

ICRG index. International Country Risk Guide (ICRG) index of property rights is an equally weighted index constructed from the Political Risk Service (PRS) sub-indices on corruption, rule of law and quality of bureaucracy where all are first rescaled to 0-10 and then the sum is rescaled to 0-50 as in Knack and Keefer (1995). PRS is a commercial data provider and their data is available for purchase at http://www.prsgroup.com.

ICRG Rule of Law. ICRG index on law and order as produced by PRS. The index is converted from a 0-6 variable to a 0-1 scale as in Barro (2015).

Control of corruption. Worldwide Governance Indicators series CC.EST. Detailed documentation of the WGI, interactive tools for exploring the data, and full access to the underlying source data is available at www.govindicators.org. See Kaufmann, Daniel, Aart Kraay and Massimo Mastruzzi (2010). "The Worldwide Governance Indicators: Methodology and Analytical Issues". World Bank Policy Research Working Paper No. 5430.

Democracy. Freedom House series on Political rights. The original data is scaled 1-7 where 1 is best and 7 worst. This has been converted to a 0-1 scale where 0 is worst and 1 is best as in Barro (2015).

Life expectancy. World Bank series SP.DYN.LE00.IN from the database Health Nutrition and Population Statistics is defined as life expectancy at birth, total (years). Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.

Fertility. World Bank series SP.DYN.TFRT.IN from the database Health Nutrition and Population Statistics Fertility rate, total (births per woman). Total fertility rate represents the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with age-specific fertility rates of the specified year.

Female school years. The average female years of schooling from the Barro-Lee country spreadsheets on education available at www.barrolee.com. See Barro, Robert and Jong-Wha Lee, 2013, "A New Data Set of Educational Attainment in the World, 1950-2010." *Journal of Development Economics*, vol 104, pp.184-198.

EBRD index. The sum of EBRD's six transition indicators: Large scale privatization, Small scale privatization, Governance and enterprise restructuring, Price liberalization, Trade and Forex system,

and Competition Policy. Available at http://www.ebrd.com/what-we-do/economic-research-and-data/data/forecasts-macro-data-transition-indicators.html.

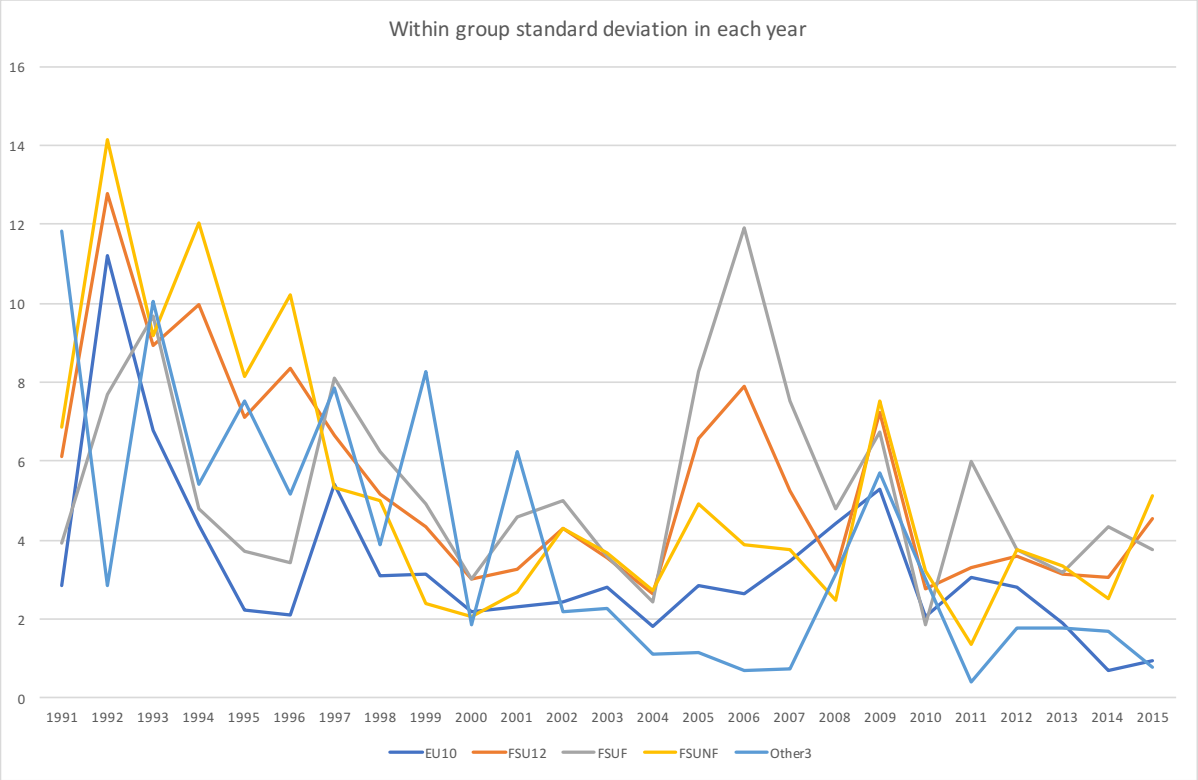
Govt/GDP. PWT series csh_g, which is government consumption as share of GDP at current PPPs.

Openness. The sum of exports and imports to GDP based on PWT variables csh_m and csh_x, which are the shares of merchandise imports and exports at current PPPs respectively. Since csh_m is recorded as negative numbers in PWT, the formula to compute openness is csh_x - csh_m.

Inflation. Percent change of average consumer prices from the International Monetary Fund's World Economic Outlook Database, October 2016. Available at http://www.imf.org/external/pubs/ft/weo/2016/02/weodata/index.aspx.

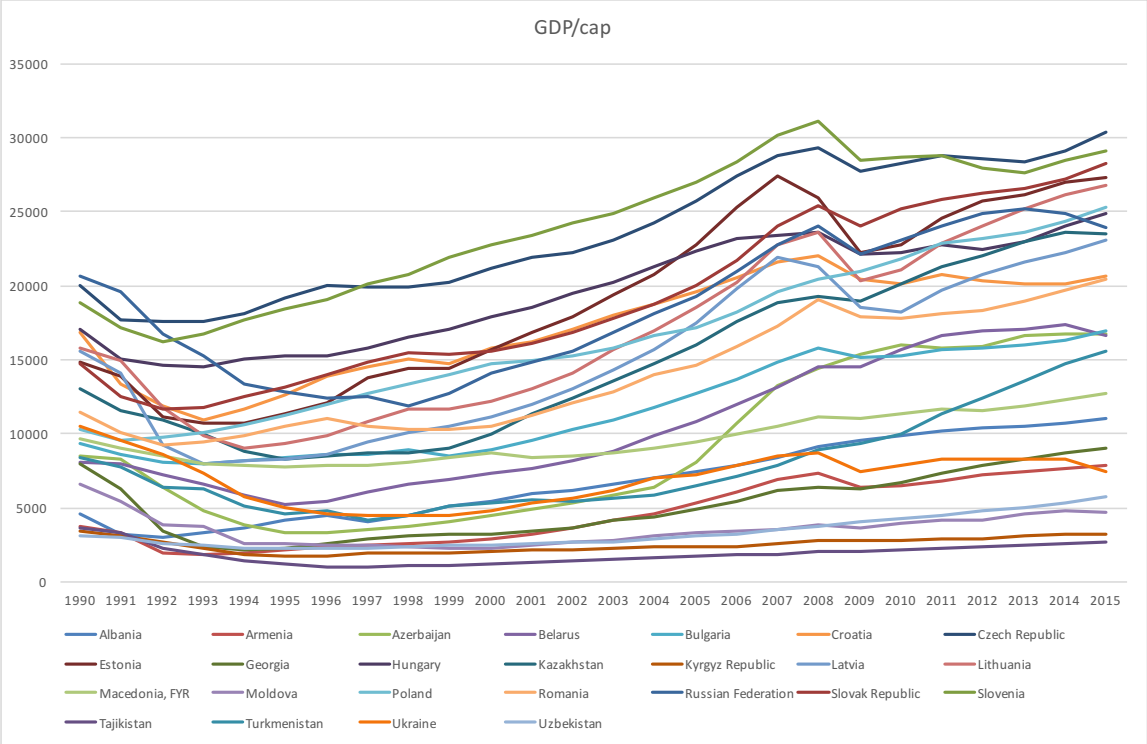
Terms of trade change. The annual percent change in the World Bank series TT.PRI.MRCH.XD.WD, which is the net barter terms of trade index (2000 = 100) calculated as the percentage ratio of the export unit value indexes to the import unit value indexes, measured relative to the base year 2000.

Additional group charts and tables



GDP per capita growth (%), annual averages (World Bank, WDI)				
	1967-1989	1991-2015	1991-1999	2000-2015
Europe & Central Asia	2.2	1.4	1.1	1.5
European Union	2.8	1.4	1.9	1.2
High income	2.8	1.4	1.8	1.2
Low & middle income	2.5	3.1	1.2	4.2
Low income	-0.2	1.0	-0.8	2.0
Middle income	2.6	3.3	1.3	4.4
World	1.9	1.4	1.1	1.6

Charts and tables on individual countries



Real GDP per capita growth (annual in %)									
	Average			StDev			Avg/stdev		
	1991-2015	1991-1999	2000-2015	1991-2015	1991-1999	2000-2015	1991-2015	1991-1999	2000-2015
Albania	3.4	1.0	5.0	9.1	14.5	2.4	0.4	0.1	2.1
Armenia	3.9	-1.9	7.1	11.8	16.2	7.3	0.3	-0.1	1.0
Azerbaijan	3.6	-7.0	9.6	13.7	13.5	9.7	0.3	-0.5	1.0
Belarus	3.2	-1.4	5.8	7.2	8.8	4.6	0.4	-0.2	1.3
Bulgaria	2.2	-1.6	4.5	4.9	4.6	3.6	0.4	-0.3	1.3
Croatia	1.0	-1.0	2.2	6.8	10.3	3.6	0.2	-0.1	0.6
Czech Republic	1.8	0.3	2.6	3.9	5.0	3.0	0.5	0.1	0.9
Estonia	2.8	0.0	4.3	7.8	9.6	6.5	0.4	0.0	0.7
Georgia	1.1	-8.1	6.9	14.3	19.7	4.1	0.1	-0.4	1.7
Hungary	1.4	-0.2	2.4	4.0	4.9	3.0	0.4	0.0	0.8
Kazakhstan	2.6	-3.8	6.2	6.9	6.2	4.2	0.4	-0.6	1.5
Kyrgyz Republic	0.0	-5.5	3.1	7.7	10.1	3.5	0.0	-0.5	0.9
Latvia	2.2	-3.3	5.3	10.4	13.8	6.6	0.2	-0.2	0.8
Lithuania	2.5	-2.8	5.5	8.8	10.9	5.9	0.3	-0.3	0.9
Macedonia	1.2	-1.5	2.7	3.6	3.9	2.5	0.3	-0.4	1.1
Moldova	-0.6	-10.3	4.8	10.8	12.4	4.1	-0.1	-0.8	1.2
Poland	3.1	2.0	3.8	4.1	6.3	1.7	0.8	0.3	2.2
Romania	2.2	-1.5	4.5	5.7	6.1	4.2	0.4	-0.2	1.1
Russian Federation	0.8	-5.0	4.1	7.0	6.6	4.9	0.1	-0.8	0.8
Slovak Republic	2.8	0.8	3.9	5.3	7.3	3.6	0.5	0.1	1.1
Slovenia	1.8	1.8	1.9	4.2	5.2	3.6	0.4	0.3	0.5
Tajikistan	-0.6	-11.6	5.6	11.0	11.9	2.0	-0.1	-1.0	2.8
Turkmenistan	3.0	-4.7	7.2	9.4	11.6	4.1	0.3	-0.4	1.8
Ukraine	-0.9	-8.7	3.5	9.3	7.3	7.2	-0.1	-1.2	0.5
Uzbekistan	2.6	-2.4	5.5	5.1	5.4	1.8	0.5	-0.4	3.1
Average	1.9	-3.1	4.7	7.7	9.3	4.3	0.2	-0.3	1.1

Model predictions and residuals for individual countries

The individual country estimates for the Levine and Renelt (1992) model are available below. In some cases, the initial value of secondary schooling is not available for the starting year of the sample and then this is approximated by the secondary school data from the closest year. For 1991, Croatia, Russia and Tajikistan estimates use data for 1993, while Turkmenistan that lacks data on secondary schooling altogether is approximated by data for Ukraine. For 2000, data for Azerbaijan is for 1997, Belarus for 1998, Romania for 1999.

	1991-2015	1991	1991-2015	1991	1991-2015	1991-2015	1991-2015	1991-2015
	constant	initlal GDP	pop growth	sec school	inv/GDP	predicted	actual	residual (a-p)
	Variable averages							
Albania	1	0.79	-0.52	0.91	0.20	5.40	3.43	-1.97
Armenia	1	0.88	-0.64	0.91	0.14	4.41	3.86	-0.56
Azerbaijan	1	2.19	1.19	0.88	0.17	3.67	3.64	-0.03
Belarus	1	2.10	-0.27	0.93	0.19	4.76	3.17	-1.59
Bulgaria	1	1.96	-0.73	0.98	0.15	4.53	2.16	-2.36
Croatia	1	3.28	-0.38	0.81	0.23	4.67	1.04	-3.63
Czech Republic	1	4.56	0.08	0.90	0.26	4.87	1.77	-3.10
Estonia	1	3.02	-0.72	1.02	0.25	6.00	2.78	-3.22
Georgia	1	1.66	-1.07	0.95	0.14	4.38	1.10	-3.28
Hungary	1	3.27	-0.21	0.85	0.20	4.36	1.39	-2.96
Kazakhstan	1	3.04	0.28	0.98	0.18	4.18	2.62	-1.56
Kyrgyz Republic	1	0.83	1.22	1.00	0.10	3.30	0.01	-3.29
Latvia	1	3.69	-1.19	0.92	0.21	4.95	2.18	-2.77
Lithuania	1	3.73	-0.96	0.92	0.16	3.97	2.52	-1.45
Macedonia	1	2.02	0.16	0.88	0.17	4.25	1.19	-3.06
Moldova	1	1.56	-0.16	0.90	0.13	3.87	-0.64	-4.52
Poland	1	2.33	-0.01	0.89	0.18	4.27	3.11	-1.15
Romania	1	1.88	-0.63	0.96	0.21	5.45	2.18	-3.27
Russian Federation	1	3.10	-0.11	0.87	0.18	4.11	0.83	-3.28
Slovak Republic	1	3.02	0.09	0.88	0.23	4.85	2.79	-2.06
Slovenia	1	4.98	0.13	1.03	0.28	5.52	1.84	-3.68
Tajikistan	1	0.87	1.88	0.75	0.06	1.64	-0.58	-2.22
Turkmenistan	1	2.04	1.53	0.92	0.28	5.64	2.96	-2.68
Ukraine	1	2.52	-0.55	0.92	0.14	3.93	-0.91	-4.84
Uzbekistan	1	0.79	1.69	0.99	0.08	2.74	2.65	-0.09
average	1	2.40	0.00	0.92	0.18	4.39	1.88	-2.51
	Impact on predicted growth							
Albania	-0.83	-0.28	0.20	2.89	3.42			
Armenia	-0.83	-0.31	0.24	2.89	2.41			
Azerbaijan	-0.83	-0.77	-0.45	2.78	2.94			
Belarus	-0.83	-0.74	0.10	2.96	3.26			
Bulgaria	-0.83	-0.68	0.28	3.11	2.66			
Croatia	-0.83	-1.15	0.15	2.56	3.94			
Czech Republic	-0.83	-1.59	-0.03	2.85	4.48			
Estonia	-0.83	-1.06	0.27	3.24	4.38			
Georgia	-0.83	-0.58	0.40	3.00	2.38			
Hungary	-0.83	-1.14	0.08	2.70	3.55			
Kazakhstan	-0.83	-1.07	-0.11	3.10	3.08			
Kyrgyz Republic	-0.83	-0.29	-0.46	3.17	1.72			
Latvia	-0.83	-1.29	0.45	2.93	3.70			
Lithuania	-0.83	-1.30	0.36	2.91	2.83			
Macedonia	-0.83	-0.71	-0.06	2.81	3.04			
Moldova	-0.83	-0.55	0.06	2.87	2.32			
Poland	-0.83	-0.82	0.00	2.81	3.10			
Romania	-0.83	-0.66	0.24	3.05	3.65			
Russian Federation	-0.83	-1.08	0.04	2.77	3.22			
Slovak Republic	-0.83	-1.06	-0.04	2.79	3.98			
Slovenia	-0.83	-1.74	-0.05	3.28	4.86			
Tajikistan	-0.83	-0.30	-0.72	2.38	1.11			
Turkmenistan	-0.83	-0.71	-0.58	2.92	4.84			
Ukraine	-0.83	-0.88	0.21	2.92	2.51			
Uzbekistan	-0.83	-0.28	-0.64	3.15	1.34			
average	-0.83	-0.84	0.00	2.91	3.15			

	1991-1999	1991	1991-1999	1991	1991-1999	1991-1999	1991-1999	1991-1999
	constant	initlal GDP	pop growth	sec school	inv/GDP	predicted	actual	residual (a-p)
	Variable averages							
Albania	1	0.79	-0.62	0.91	0.07	3.30	0.97	-2.33
Armenia	1	0.88	-1.51	0.91	0.12	4.39	-1.90	-6.28
Azerbaijan	1	2.19	1.21	0.88	0.12	2.76	-7.04	-9.80
Belarus	1	2.10	-0.17	0.93	0.19	4.81	-1.43	-6.24
Bulgaria	1	1.96	-0.67	0.98	0.08	3.28	-1.57	-4.86
Croatia	1	3.28	-0.54	0.81	0.18	3.91	-0.96	-4.87
Czech Republic	1	4.56	-0.05	0.90	0.23	4.48	0.25	-4.23
Estonia	1	3.02	-1.42	1.02	0.19	5.27	0.04	-5.23
Georgia	1	1.66	-0.84	0.95	0.10	3.69	-8.13	-11.82
Hungary	1	3.27	-0.15	0.85	0.17	3.81	-0.22	-4.02
Kazakhstan	1	3.04	-1.01	0.98	0.16	4.36	-3.83	-8.19
Kyrgyz Republic	1	0.83	1.08	1.00	0.09	3.28	-5.51	-8.79
Latvia	1	3.69	-1.20	0.92	0.14	3.79	-3.29	-7.08
Lithuania	1	3.73	-0.53	0.92	0.12	3.09	-2.78	-5.87
Macedonia	1	2.02	0.02	0.88	0.13	3.62	-1.45	-5.07
Moldova	1	1.56	-0.15	0.90	0.13	3.91	-10.32	-14.23
Poland	1	2.33	0.16	0.89	0.17	4.13	2.00	-2.13
Romania	1	1.88	-0.36	0.96	0.19	4.96	-1.52	-6.48
Russian Federation	1	3.10	-0.08	0.87	0.22	4.80	-5.04	-9.83
Slovak Republic	1	3.02	0.20	0.88	0.23	4.78	0.78	-4.00
Slovenia	1	4.98	-0.08	1.03	0.24	4.95	1.80	-3.15
Tajikistan	1	0.87	1.56	0.75	0.07	1.89	-11.61	-13.51
Turkmenistan	1	2.04	2.15	0.92	0.35	6.70	-4.66	-11.36
Ukraine	1	2.52	-0.49	0.92	0.18	4.49	-8.72	-13.21
Uzbekistan	1	0.79	1.89	0.99	0.08	2.69	-2.36	-5.05
average	1	2.40	-0.06	0.92	0.16	4.05	-3.06	-7.11
	Impact on predicted growth							
Albania	-0.83	-0.28	0.23	2.89	1.28			
Armenia	-0.83	-0.31	0.57	2.89	2.06			
Azerbaijan	-0.83	-0.77	-0.46	2.78	2.03			
Belarus	-0.83	-0.74	0.06	2.96	3.35			
Bulgaria	-0.83	-0.68	0.25	3.11	1.44			
Croatia	-0.83	-1.15	0.20	2.56	3.13			
Czech Republic	-0.83	-1.59	0.02	2.85	4.04			
Estonia	-0.83	-1.06	0.54	3.24	3.38			
Georgia	-0.83	-0.58	0.32	3.00	1.79			
Hungary	-0.83	-1.14	0.06	2.70	3.02			
Kazakhstan	-0.83	-1.07	0.38	3.10	2.77			
Kyrgyz Republic	-0.83	-0.29	-0.41	3.17	1.64			
Latvia	-0.83	-1.29	0.46	2.93	2.53			
Lithuania	-0.83	-1.30	0.20	2.91	2.11			
Macedonia	-0.83	-0.71	-0.01	2.81	2.36			
Moldova	-0.83	-0.55	0.06	2.87	2.36			
Poland	-0.83	-0.82	-0.06	2.81	3.03			
Romania	-0.83	-0.66	0.13	3.05	3.27			
Russian Federation	-0.83	-1.08	0.03	2.77	3.91			
Slovak Republic	-0.83	-1.06	-0.08	2.79	3.95			
Slovenia	-0.83	-1.74	0.03	3.28	4.21			
Tajikistan	-0.83	-0.30	-0.59	2.38	1.24			
Turkmenistan	-0.83	-0.71	-0.82	2.92	6.14			
Ukraine	-0.83	-0.88	0.18	2.92	3.09			
Uzbekistan	-0.83	-0.28	-0.72	3.15	1.36			
average	-0.83	-0.84	0.02	2.91	2.78			

	2000-2015	2000	2000-2015	2000	2000-2015	2000-2015	2000-2015	2000-2015
	constant	initlal GDP	pop growth	sec school	inv/GDP	predicted	actual	residual (a-p)
	Variable averages							
Albania	1	1.06	-0.46	0.71	0.27	5.94	4.96	-0.98
Armenia	1	0.61	-0.16	0.91	0.15	4.52	7.10	2.58
Azerbaijan	1	0.93	1.19	0.72	0.20	4.17	9.65	5.47
Belarus	1	1.53	-0.33	0.86	0.18	4.69	5.76	1.07
Bulgaria	1	1.68	-0.76	0.93	0.19	5.19	4.49	-0.70
Croatia	1	2.84	-0.29	0.86	0.25	5.43	2.16	-3.26
Czech Republic	1	4.26	0.16	0.88	0.27	5.17	2.62	-2.55
Estonia	1	2.49	-0.32	0.94	0.28	6.38	4.32	-2.06
Georgia	1	0.68	-1.19	0.79	0.16	4.63	6.86	2.24
Hungary	1	3.13	-0.24	0.96	0.22	5.08	2.40	-2.68
Kazakhstan	1	2.08	1.01	0.93	0.19	4.29	6.24	1.95
Kyrgyz Republic	1	0.43	1.30	0.84	0.10	2.96	3.11	0.15
Latvia	1	2.12	-1.18	0.91	0.25	6.16	5.26	-0.90
Lithuania	1	2.23	-1.20	0.98	0.19	5.21	5.50	0.30
Macedonia	1	1.64	0.24	0.99	0.20	5.10	2.67	-2.43
Moldova	1	0.49	-0.16	0.82	0.13	3.94	4.80	0.85
Poland	1	2.81	-0.11	0.79	0.18	3.89	3.81	-0.07
Romania	1	1.55	-0.78	0.92	0.22	5.74	4.49	-1.25
Russian Federation	1	1.80	-0.13	0.86	0.16	4.11	4.13	0.02
Slovak Republic	1	3.00	0.03	1.01	0.23	5.31	3.93	-1.38
Slovenia	1	4.77	0.25	0.73	0.30	4.98	1.86	-3.12
Tajikistan	1	0.25	2.07	0.83	0.06	1.96	5.63	3.67
Turkmenistan	1	1.12	1.18	1.04	0.23	5.68	7.24	1.56
Ukraine	1	1.01	-0.59	1.04	0.12	4.49	3.48	-1.01
Uzbekistan	1	0.52	1.58	0.86	0.08	2.45	5.46	3.02
average	1	1.80	0.04	0.88	0.19	4.70	4.72	0.02
	Impact on predicted growth							
Albania	-0.83	-0.37	0.17	2.27	4.70			
Armenia	-0.83	-0.21	0.06	2.88	2.63			
Azerbaijan	-0.83	-0.33	-0.45	2.29	3.49			
Belarus	-0.83	-0.54	0.13	2.72	3.21			
Bulgaria	-0.83	-0.59	0.29	2.93	3.39			
Croatia	-0.83	-0.99	0.11	2.71	4.43			
Czech Republic	-0.83	-1.49	-0.06	2.80	4.74			
Estonia	-0.83	-0.87	0.12	2.97	4.98			
Georgia	-0.83	-0.24	0.45	2.50	2.74			
Hungary	-0.83	-1.10	0.09	3.05	3.87			
Kazakhstan	-0.83	-0.73	-0.38	2.96	3.27			
Kyrgyz Republic	-0.83	-0.15	-0.49	2.67	1.76			
Latvia	-0.83	-0.74	0.45	2.89	4.40			
Lithuania	-0.83	-0.78	0.45	3.11	3.25			
Macedonia	-0.83	-0.57	-0.09	3.15	3.45			
Moldova	-0.83	-0.17	0.06	2.59	2.30			
Poland	-0.83	-0.98	0.04	2.51	3.15			
Romania	-0.83	-0.54	0.30	2.93	3.88			
Russian Federation	-0.83	-0.63	0.05	2.72	2.80			
Slovak Republic	-0.83	-1.05	-0.01	3.20	4.00			
Slovenia	-0.83	-1.67	-0.09	2.32	5.25			
Tajikistan	-0.83	-0.09	-0.79	2.63	1.03			
Turkmenistan	-0.83	-0.39	-0.45	3.29	4.06			
Ukraine	-0.83	-0.35	0.22	3.29	2.16			
Uzbekistan	-0.83	-0.18	-0.60	2.74	1.32			
average	-0.83	-0.63	-0.02	2.81	3.37			

Running the Levine/Renelt regression on our 25 countries for different time periods

```
. regress growth9115 initlal91 popg9115 sec91 inv9115

      Source |       SS       df       MS      Number of obs   =        25
-------------+------------------------------   F(4, 20)        =      1.87
       Model |  11.9704995     4  2.99262489   Prob > F        =    0.1560
    Residual |  32.0827641    20  1.60413821   R-squared       =    0.2717
-------------+------------------------------   Adj R-squared   =    0.1261
       Total |  44.0532637    24  1.83555265   Root MSE        =    1.2665

------------------------------------------------------------------------------
   growth9115 |      Coef.   Std. Err.      t    P>|t|
--------------+---------------------------------------------------------------
    initlal91 |  -.5082283   .3219099    -1.58   0.130
    popg9115 |  -.045541   .3212159    -0.14   0.889
       sec91 |   3.853715   4.113619     0.94   0.360
     inv9115 |    15.5373   6.571761     2.36   0.028
       _cons |  -3.232297   3.789726    -0.85   0.404
------------------------------------------------------------------------------

. regress growth9199 initlal91 popg9199 sec91 inv9199

      Source |       SS       df       MS      Number of obs   =        25
-------------+------------------------------   F(4, 20)        =      1.66
       Model |  84.1859715     4  21.0464929   Prob > F        =    0.1983
    Residual |   253.34566    20   12.667283   R-squared       =    0.2494
-------------+------------------------------   Adj R-squared   =    0.0993
       Total |  337.531632    24   14.063818   Root MSE        =    3.5591

------------------------------------------------------------------------------
   growth9199 |      Coef.   Std. Err.      t    P>|t|
--------------+---------------------------------------------------------------
    initlal91 |   .7741079   .8468469     0.91   0.372
    popg9199 |  -.7163728   .8629085    -0.83   0.416
       sec91 |    12.29787   11.57173     1.06   0.301
     inv9199 |   8.836491   14.42398     0.61   0.547
       _cons |  -17.67187   10.69804    -1.65   0.114
------------------------------------------------------------------------------

. regress growth0015 initlal00 popg0015 sec00 inv0015

      Source |       SS       df       MS      Number of obs   =        25
-------------+------------------------------   F(4, 20)        =      3.95
       Model |  35.9771493     4  8.99428731   Prob > F        =    0.0160
    Residual |  45.4896675    20  2.27448337   R-squared       =    0.4416
-------------+------------------------------   Adj R-squared   =    0.3299
       Total |  81.4668167    24  3.3944507   Root MSE        =    1.5081

------------------------------------------------------------------------------
   growth0015 |      Coef.   Std. Err.      t    P>|t|
--------------+---------------------------------------------------------------
    initlal00 |  -1.361311   .3863913    -3.52   0.002
    popg0015 |   .291749   .387959     0.75   0.461
       sec00 |  -1.578324   3.366432    -0.47   0.644
     inv0015 |   12.78292   7.697387     1.66   0.112
       _cons |   6.093366   3.283884     1.86   0.078
------------------------------------------------------------------------------
```

International oil prices and growth in the CIS Fuel exporting group

The fuel exporting FSU countries are all affected by changes in international oil prices but the strength of this effect varies between the countries. The table below shows first how the growth model residual correlates with changes in international oil prices and then how much a simple growth "model" that only includes changes in international oil prices explains annual growth rates. Russia is the country with the highest sensitivity to oil price changes (R^2 of 0.66) and other GDP measures deliver even higher R^2 for Russia. Except for Azerbaijan, oil price changes explain more of annual growth in the later sample period 2000-2015. Below is a table that shows residuals and R^2 for univariate growth regressions with changes in oil prices on the right hand side.

	1991-1999	2000-2015
avg oil price change	-0.9	10.6
avg residual	-9.8	2.3
AZE	-9.8	5.5
KAZ	-8.2	2.0
RUS	-9.8	0.0
TKM	-11.4	1.6
r-sq avg	0.26	0.33
AZE	0.39	0.23
KAZ	0.05	0.32
RUS	0.51	0.66
TKM	0.08	0.12

A more detailed view on how correlations between oil prices and growth has changed over time is provided in the figure below which shows rolling correlations based on 10 year backward looking windows (i.e. data in 2000 is based on 1991 to 2000). Again Russia shows the highest correlation in this group with no sign that the correlation has declined over time. Growth in Turkmenistan, which showed a modest R^2 in the table above, seems to have become significantly correlated with oil prices in the more recent years as has growth in Kazakhstan.